

Bio-based beverage cartons

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Beverage cartons have already been on the market for over 100 years. The milk carton, originally entirely made of paperboard and thus 100 percent bio-based, was patented in 1915. A century later, beverage cartons are the most widely used packaging for fresh liquid fluids such as milk, yoghurt and other dairy produce.

Packaging in cartons became so popular with beverage suppliers because of lower (transport) costs, and with consumers for their convenience: cartons are lighter and safer to use than glass. Whether single-use beverage cartons are also more environmentally friendly than re-usable glass bottles is highly debated.

Beverage cartons are usually made of a combination of packaging board coated with a plastic layer of polyethylene (PE). The board gives maximum strength for a minimum of weight and the coating makes the carton waterproof. A growing number of packages have re-sealable closures (caps) that are also made of PE. Since these caps are in use, the average weight of a 1 litre carton has grown by about one-quarter.

Beverage cartons for long-life liquid products, also called 'aseptic products', like (sterilised) [dairy products](#), soy milk, juices, fruit-based lemonades and non-carbonated waters, additionally have a foil laminate, a thin aluminium layer that protect [beverages](#) from light and oxygen. The aluminium layer is just 6.5 micrometres thick, less than a quarter of a hair. Aluminium is an excellent barrier for oxygen and light and thanks to this these drinks can last for up to 18 months without preservatives or refrigeration.

According to Deutsche Umwelthilfe (DHU), in 2014 the average weight of a 1 litre beverage carton was 35 gram, of which 70 percent is paperboard, 26 percent is PE and 4 percent is aluminium. It would be a mistake to think that common cartons are almost entirely made of renewable feedstock.

Twenty plants from just three companies (Tetra Pak, Elopak and SIG Combibloc) produce >90 percent of the beverage cartons used in Europe. About all paperboard used is sourced from Sweden and Finland, where trees with wood fibres of sufficient length (such as spruce, pine birch and eucalyptus) can be found.

Consumers are increasingly demanding environmentally-friendly products and packaging that is sustainable. Sales of consumer goods from brands with a demonstrated commitment to sustainability are growing much stronger than those without. To address this demand, all three companies (Tetra Pak, Elopak and SIG Combibloc) have developed cartons that are 100 percent bio-based, just like the milk carton a century ago.

The plastic polyethylene it is usually derived from fossil resources. A steadily increasing volume of PE is made from biomass (residues like e.g. sugarcane from Brazil or tall oil from Nordic forests). The renewable PE is finding increasing application in beverage cartons, initially for the PE cap and later also for the PE coating. Examples include the Tetra Rex and the Pure-Pak bio-based milk cartons. SIG's aseptic Signature Pack contains a special polyamide (PA) polymer barrier as a replacement for aluminium.

Three years after its introduction in 2015 Elopak hit the one billion mark for its 100 percent renewable carton. Nonetheless the 100 percent bio-based containers have a (very) modest market share to date.

To reduce the [environmental impact](#), single use packaging should ideally be recycled. For beverage cartons it has always been a big problem that, although technically recyclable, there weren't many places that could actually recycle them. Because they consist of multiple layers, it is difficult to separate and recycle the different materials. That situation has gradually improved with an increasing number of specialised [recycling](#) plants (some 25 across Europe) and a steadily growing recycling rate.

All of the materials used in the manufacture of beverage cartons – paper fibres, plastics and aluminium – can be and are recycled by using relatively simple techniques. The material is turned into new products,

cutting the amount of waste sent to landfill and reducing demand for resources. The paper fibres are used in the paper industry as raw material for e.g. office supplies, cardboard boxes and tissue paper. The plastic (polyethylene) and the aluminium are used as pure raw material for various products including crates, buckets, pans, coffee pots and aluminium tubes. A share of the PE and aluminium finds application in the cement industry (in clinker kilns, as secondary fuels, substituting hard coal).

In an increasing number of European countries waste is collected in separate streams, like paper and cardboard, glass, green waste, textiles, plastics, et cetera. In the Netherlands, beverage cartons are co-collected with plastic waste and metal containers, fairly similar to the system used in Belgium. Other EU countries or regions have adopted the same or slightly different collection systems.

Belgium and Germany were early to introduce beverage carton recycling and show official recycling rates of 89 percent and 75 percent respectively. The Netherlands introduced beverage carton recycling only in 2015. For the whole of Europe the material recycling rate of beverage cartons has increased from just over 5 percent in 1993 to more than 47 percent in 2016. The rest of the cartons are either incinerated or landfilled. As a result of the recent ratification of the EU's Circular Economy Packaging (CEP), the official recycling rate of paper and cardboard packaging has to increase to 85 percent in 2030.

Environmental NGOs (like DHU in Germany) critically review the official recycling data. Deducting beverage cartons not collected or sorted properly, contaminating materials and the plastic components (which are burned, rather than recycled) they calculated for Germany for 2012 a "real" material recycling rate of 36.5 percent, versus the official rate of 71 percent.

In terms of sustainability, a lot has been achieved in the sector in recent years, including 100 percent use of FSC certified paperboard, introducing 100 percent renewable packages as well as beverage cartons applying unbleached paperboard. Next steps will include e.g. achieving 100 percent electricity supply from renewable sources, 100 percent of beverage cartons being fully bio-based and a substantial increase in the rate of material recycling (recovery and recycling of product materials).

Product recycling, where the product (here: package) or parts of it (virgin fibres) are reused, remains a challenge in the case of dairy product packages. The thick dairy products that stay behind in the packages make product recycling difficult.

Another challenge is developing an aseptic carton pack fully made of renewable plant materials, because it is difficult to replace the aluminium layer.

Provided by Youris.com

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